

What is claimed is:

1. A method of detecting transcription activity comprising detecting the presence or absence of a nick in a DNA molecule, wherein
5 the presence of a nick in the DNA molecule indicates transcription activity.
2. The method of claim 1 wherein the presence or absence of a nick in a DNA molecule is measured by determining the change in
10 electrophoretic mobility of nicked DNA on an electrophoretic gel.
3. The method of claim 1 wherein the presence or absence of a nick in a DNA molecule is determined by a SI nuclease assay.
- 15 4. The method of claim 1 wherein the presence or absence of a nick in a DNA molecule is determined by a primer extension reaction.
5. The method of claim 1 wherein the presence or absence of a nick in a DNA molecule is determined by a polymerase chain reaction
20 amplification reaction.
6. The method of claim 1 wherein the presence or absence of a nick in a DNA molecule is determined by a DNA sequencing assay.
- 25 7. The method of claim 1 wherein the presence or absence of a nick in a DNA molecule is determined by a protein binding assay.
8. The method of claim 1 wherein the DNA is affixed to a matrix.
- 30 9. The method of claim 8 wherein the matrix is a biological chip.

10. A method of detecting transcription activity comprising the steps of :

- a) providing a DNA template comprising at least one binding region for a transcription factor;
- 5 b) contacting the DNA template with at least one transcription factor; and
- c) detecting the presence or absence of a nick in the DNA template, wherein the presence of a nick in the DNA template indicates transcription activity.

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11. The method of claim 10, wherein the transcription factor is in a nuclear cell extract.

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12. The method of claim 10, wherein the DNA template is inserted into a viral or plasmid vector and introduced into a cell.

13. The method of claim 10, wherein the DNA template is fixed to a matrix.

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14. The method of claim 13, wherein the matrix is a biological chip.

15. A method of screening for an active transcription factor, the method comprising the steps of:

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- a) providing a DNA template;
- b) contacting the DNA template with a test protein; and
- c) detecting the presence or absence of a single-stranded nick in the DNA template, wherein the presence of a nick in the DNA template indicates that the test protein is an active transcription factor.

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16. The method of claim 15, wherein the DNA template is fixed to a

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matrix.

17. The method of claim 16, wherein the matrix is a biological chip.

5 18. The method of claim 15, wherein the test protein is present in a cell extract.

19. The method of claim 15, wherein the test protein is a recombinant protein.

10 20. The method of claim 15, wherein said DNA template comprises at least one binding region for a transcription factor.

15 21. A method of modulating transcription activity comprising the steps of:

a) providing a DNA sequence to be transcribed, wherein the DNA sequence comprises at least one consensus binding site for a nicking transcription factor; and

b) contacting the DNA sequence with a nicking transcription factor, wherein the nicking transcription factor catalyses a nick in the DNA template.

20 22. The method of claim 21, wherein the DNA sequence is inserted into a viral or plasmid vector and said viral or plasmid vector is introduced into a cell.

25 23. The method of claim 22, wherein said cell is an animal cell.

24. The method of claim 23, wherein said mammalian cell is a human cell.

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25. The method of claim 22, wherein said cell is selected from the group consisting of mammalian cells, yeast cells, insect cells, algae cells and plant cells.

5 26. The method according to claim 25, wherein the plant cell is a monocot or a dicot cell.

10 27. The method of claim 21, wherein the nicking transcription factor is phosphorylated *in vitro* before contacting the DNA sequence.

15 28. The method of claim 21, wherein the nicking transcription factor is a recombinant nicking transcription factor comprising at least one acidic amino acid substitution, or conversely one amino acid substitution that cannot be phosphorylated.

20 29. A method of producing a single-stranded nick in a double stranded DNA molecule comprising contacting the DNA molecule with a nicking transcription factor.

25 30. The method of claim 29, wherein the nicking transcription factor is phosphorylated.

30 31. The method of claim 29, wherein the nicking transcription factor is a recombinant nicking transcription factor comprising at least one acidic amino acid substitution, or conversely one amino acid substitution that cannot be phosphorylated.

32. A kit for the rapid detection of transcription activity comprising a reagent for detecting the presence or absence of a single stranded nick in a DNA molecule.

33. The kit according to claim 32, wherein said reagent includes material for an electrophoretic gel.

5 34. The kit according to claim 32, wherein said reagent includes materials for an SI nuclease assay.

10 35. The kit according to claim 32, wherein said reagent includes materials for a primer extension assay.

15 36. The kit according to claim 32, wherein said reagent includes materials for a polymerase chain reaction.

20 37. The kit according to claim 32, wherein said reagent includes materials for a DNA sequencing reaction.

25 38. A kit for rapid screening for an activated transcription factor, the kit comprising:

- a) a DNA template comprising at least one consensus sequence for a nicking transcription factor; and
- b) at least one detection reagent which is capable of identifying a nicked DNA template.

39. The kit of claim 38, wherein the DNA template is fixed onto a matrix.

40. The kit of claim 39, wherein the matrix is a biological chip.

41. The kit of claim 38, wherein the detection reagent comprises a detectable label.

42. The kit of claim 38, wherein the detectable label is a radioisotope, a fluorophore, biotin, a chemiluminescent compound, or a conjugated antibody.

5 43. A method for detecting a DNA consensus sequence for a nicking transcription factor, the method comprising the steps of:

10 a) providing a DNA molecule comprising a transcription promoter region or a region upstream of a transcription initiation site of a gene;

15 b) contacting the DNA molecule with a nicking transcription factor;

15 c) detecting the absence or presence of a single stranded nick in the DNA molecule; and

15 d) identifying the consensus sequence surrounding the single stranded nick in the DNA.

20 44. The method of claim 43, wherein the nicking transcription factor is phosphorylated *in vitro* before contacting the DNA molecule.

20 45. The method of claim 43, wherein the nicking transcription factor is a recombinant nicking transcription factor comprising at least one acidic amino acid substitution modification, or conversely one amino acid substitution that cannot be phosphorylated.

25 46. A method of identifying a transcription factor comprising detecting the presence or absence of a nick in a DNA molecule wherein the presence of a nick indicates transcription activity.

30 47. The method of claim 46 wherein the presence or absence of a nick in a DNA molecule is measured by determining the change